REMARKS

The Office Action dated June 22, 2009 has been received and carefully noted. The above amendments to the claims, and the following remarks, are submitted as a full and complete response thereto.

Claims 1 and 6-8 have been amended to more particularly point out and distinctly claim the subject matter of the invention. Support for the amendment may be found in the specification, for example, at paragraphs 0062-0063. No new matter has been added, and a proper Request for Continued Examination has been filed. Therefore, claims 1-8 are currently pending in the application and are respectfully submitted for consideration.

Claim Rejections Under 35 U.S.C. § 103(a)

The Office Action rejected claims 1-2 and 4-8 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kondylis (U.S. Patent No. 6,665,311) in view of Cousins (U.S. Patent No. 6,618,385) and Galand (U.S. Patent No. 6,628,670). The Office Action took the position that Kondylis discloses all the elements of the claims with the exception of numerous elements. The Office Action then cited Cousins and Galand as allegedly curing the deficiencies of Kondylis. Applicants respectfully submit that said claims recite subject matter neither disclosed nor suggested in Kondylis, Cousins, and Galand.

Claim 1, upon which claims 2-5 are dependent, recites a method of allocating bandwidth in a first node that is operable in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The method includes the steps of initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link, and determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. The method includes the steps of communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, and notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. The method includes the steps of adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed. The at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network.

Claim 6 recites a network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The device includes a first communication unit configured to initiate a communication between the device and a node in the network that, together, are endpoints of a link in the network, the communication being related to possible bandwidth allocation adjustment of

a flow sharing the link, and a first processing unit configured to determine a first new bandwidth allocation that approaches a first optimization condition for the flow, wherein the first processing unit is operably connected to the first communication unit. The device further includes a second communication unit configured to communicate with the node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, wherein the second communication unit is operably connected to the first communication unit, and a third communication unit configured to notify neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed, wherein the third communication unit is operably connected to the first communication unit. The device further includes a second processing unit configured to adopt the mutually-agreed upon optimal allocation for the flow when reallocation is needed, wherein the second processing unit is operably connected to the first communication unit. The at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network.

Claim 7 recites a computer readable medium encoded with a computer program to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The computer program, when executed, is configured to control a processor to perform a first sub-routine for initiating a communication between the first node and a second node in the network that, together, are endpoints of a

link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link, and a second sub-routine for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. The computer program, when executed, is configured to control a processor to perform a third sub-routine for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, and a fourth sub-routine for notifying neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. The computer program, when executed, is configured to control a processor to perform a fifth sub-routine for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed. The at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network.

Claim 8 recites a network device configured to allocate bandwidth in an ad hoc, wireless network configured to support at least one guaranteed feasible flow allocation. The device includes initiation means for initiating a communication between the first node and a second node in the network that, together, are endpoints of a link, the communication being related to possible bandwidth allocation adjustment of a flow sharing the link, and determination means for determining, in the first node, a first new bandwidth allocation that approaches a first optimization condition for the flow. The

device further includes determination means for communicating with the second node to determine a mutually-agreed upon optimal bandwidth allocation for the flow, and notification means for notifying only neighbor nodes in the network of the mutually-agreed upon optimal bandwidth allocation when reallocation is needed. The device further includes adoption means for adopting the mutually-agreed upon optimal allocation for the flow when reallocation is needed. The at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network.

As will be discussed below, the combination of Kondylis, Cousins, and Galand fails to disclose or suggest all of the elements of the claims, and therefore fails to provide the features discussed above.

Kondylis describes an apparatus, method, and computer program product for effective communication routing of unicast and broadcast data traffic in wireless ad-hoc networks. The routing technique separates the signaling and data transmission portions of a data frame such that the length of the signaling portion is independent of the length of the data portion. (See Kondylis at Abstract).

Cousins describes a network initialization process to determine the maximum available data transfer throughput, optimized bandwidth, and optimized transfer conditions in a **wired** network. (See Cousins at col. 3, lines 42-58). Specifically, the network initialization process also negotiates the number of twisted pair wires to use,

detects and identifies scrambled wires, determines the compression scheme to use, etc. These parameters are then utilized in a predetermined well known modulation communications technique such as spread spectrum or Quadrature Amplitude Modulation (QAM) to accordingly adjust the data transfer rate between the two devices. Also, the negotiation session of Cousins seeks to establish the data transfer scheme between the two machines (e.g., **how data is transferred over various twisted pair wires**) and to determine the best use of the available bandwidth. Accordingly, part of this negotiation includes the selection of compression algorithms for use in the data transfer. Moreover, the negotiation further includes reservation of part of the bandwidth for isocronous data and/or other non-LAN uses such as streaming video. (See Cousins at col. 7, lines 40-52).

Galand describes routing path selection and bandwidth reservation to connections sharing a path in a packet switched ***wireline*** communication network. (See Galand at Abstract). Galand further provides exchanging of information (109) between the origin (access) node (100), the transit nodes (107) on the path, and the destination node (108). Bandwidth Reservation (104) replies from transit nodes and end node generate either a call acceptance or a call reject (110). A Link Metric Update process (105) updates, in case of call acceptance, the modified link metrics. This information (111) is sent through the Control Spanning Tree to the Topology Database of each node in the network by means of a broadcast algorithm. (See Galand at col. 10, line 40 – col. 11, line 2).

Applicants respectfully submit that Kondylis, Cousins, and Galand, whether considered individually or in combination, fail to disclose, teach, or suggest, all of the elements of the present claims. For example, the combination of Kondylis, Cousins, and Galand fails to disclose, teach, or suggest, at least, "*wherein the at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network*," as recited in independent claim 1, and similarly recited in independent claims 6-8.

The Office Action took the position that Kondylis discloses "*an adhoc, wireless network configured to support at least one guaranteed feasible flow allocation*," as recited in independent claim 1, and similarly recited in independent claims 6-8, because Kondylis discusses enabling a set of transmitters to dynamically reserve bandwidth and adapt the reserved bandwidth according to traffic fluctuation for point-to-point packet data in wireless ad-hoc networks. (See Office Action at page 6). In other words, the Office Action is interpreting "*flow allocation*" as reading on the reserved bandwidth discussed in Kondylis, and interpreting "*guaranteed feasible*" as reading on the adapting of the reserved bandwidth.

Applicants respectfully submit that claims 1 and 6-8 have been amended to clarify the meaning of the term "*guaranteed feasible.*" Specifically, claims 1 and 6-8 have been amended to recite that a guaranteed feasible flow allocation comprises at least one flow

allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network. Thus, Applicants respectfully submit that the Office Action's interpretation of "*guaranteed feasible*" is contrary to the plain and ordinary meaning of the claim language.

Applicants further submit that the amendment to claims 1 and 6-8 is supported by the specification. For example, in defining "*feasibility*", the specification makes clear that a flow bandwidth allocation is not merely a bandwidth that has been reserved or a bandwidth that can be adapted. Instead, the specification clearly indicates that flow bandwidth allocations that are feasible are only those for which there exists a schedule that can realize them by taking into account flows in the ad hoc network. For example, under the heading "***Rate feasibility***," the specification describes that embodiments of the invention may use a fluid model to describe the feasibility of bandwidth allocations in a multi-channel ad hoc network. According to the fluid model, the rate (normalized bandwidth) r_f of a link flow f in an ad hoc network is the fraction of conflict-free slots allocated to flow f in a T-periodic schedule. Furthermore, according to the fluid model, a bandwidth allocation of flows R = (r1, …, r_f, … r_{F1}) is called feasible if there exists a conflict-free schedule that allocates to every flow f, a rate equal to r_f. (See Specification at paragraphs 0062-0063).

This definition of feasibility and the feasibility conditions discussed in the specification allow embodiments of the invention to capture the interference relationships

in wireless networks and also allow embodiments of the invention to realize both QoS objectives where the flow bandwidth allocations are known in advance (e.g. real-time traffic) and fairness objectives when the flow bandwidth allocations are not known in advance.

Kondylis merely discloses that a set of transmitters dynamically reserves bandwidth, and that the transmitters subsequently adapt the reserved bandwidth according to traffic fluctuation. (See Kondylis at col. 6, lines 13-19). In the network of Kondylis, the mere changing of a level of bandwidth reserved based on the measured traffic rate does not disclose, or suggest, a "*guaranteed feasible flow allocation*," because the changing is solely based on the measured traffic rate of the single reserved bandwidth and does not take into account other reserved bandwidths. Thus, Kondylis fails to disclose, or suggest, "*wherein the at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network*," as recited in independent claim 1, and similarly recited in independent claims 6-8.

In the "Response to Arguments" section, the Office Action took the position that the specification merely gives exemplary characteristics of the term "*feasible*," and does not explicitly define the term feasible to include all the characteristics described in the specification. The Office Action further suggested that the applicant to include the desired definition of the term in the claims. Applicants respectfully submit that the

amendment to the claims is in line with the Office Action's suggestion, and that the amendment effectively moots the Office Action's position.

Furthermore, Applicants respectfully submit that Cousins and Galand, whether considered individually or in combination, do not cure the deficiencies of Kondylis, as neither Cousins nor Galand disclose or suggest a flow allocation for which a schedule exists that realize the flow allocation by taking into account flows in the ad hoc network.

Accordingly, Applicants respectfully submit that the combination of Kondylis, Cousins, and Galand fails to disclose, or suggest, "*wherein the at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network*," as recited in independent claim 1, and similarly recited in independent claims 6-8.

Therefore, the combination of Kondylis, Cousins, and Galand fails to disclose, teach, or suggest, all of the elements of independent claims 1 and 6-8. Accordingly, Applicants respectfully request that this rejection be withdrawn.

Claims 2 and 4-5 depend upon independent claim 1. Thus, Applicants respectfully submit that claims 2 and 4-5 should be allowed for at least their dependence upon independent claim 1, and for the specific elements recited therein.

The Office Action rejected claim 3 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Kondylis, in view of Cousins and Galand, and further in view of

Counterman (U.S. Patent No. 6,724,727). The Office Action took the position that the combination of Kondylis, Cousins, and Galand discloses all the elements of the claims with the exception of "determining, in a first node, a first new bandwidth allocation that approaches at least one of a Max Min Fair condition and a Quality of Service guarantee condition." The Office Action then cited Counterman as allegedly curing the deficiencies of Kondylis, Cousins, and Galand. Applicants respectfully submit that said claims recite subject matter neither disclosed nor suggested in Kondylis, Cousins, Galand, and Counterman.

The descriptions of Kondylis, Cousins, and Galand, as discussed above, are incorporated herein. Counterman describes a method and apparatus for a communications system that prioritizes packets that are transmitted over a digital communication channel utilizing at least one error-correcting transmission path associated with a Quality of Service (QoS) objective. The QoS objective is used to select the appropriate transmission path (that may include forward error coding, scrambling, and interleaving) that satisfies the relevant metrics of the desired level of service quality such as packet latency, variation of the packet latency, information throughput, and packet error rate (PER). The communications system selects a transmission path that is associated with QoS objectives best matched to the QoS objectives as required by the originating application. (See Counterman at Abstract).

Applicants respectfully submit that the rejection is erroneous because Counterman fails to disclose, or suggest, at least, "*determining, in the first node, the first new bandwidth allocation that approaches at least one of a Max Min Fair condition and a Quality of Service guarantee condition*," as recited in claim 3.

The cited portion of Counterman merely discloses that a communications system manages, monitors, and prioritizes packets and allocates bandwidth with a packet network in order to satisfy the QoS objectives associated with the originating application. (See Counterman at col. 1, lines 63-66). Applicants respectfully submit that this disclosure is merely a statement of an intended objective and does not enable one of ordinary skill in the art how to determine if a new bandwidth allocation approaches a Quality of Service guarantee condition. In other words, one of ordinary skill in the art would readily understand that are several systems for which one can allocate bandwidth to realize a QoS guarantee condition, but a method for achieving the condition differs from system to system. Furthermore, Applicants respectfully submit that embodiments of the invention, may not only realize QoS objectively, but also may realize fairness objectives in wireless ad hoc networks, a concept not disclosed in Counterman.

Furthermore, claim 3 depends upon independent claim 1. As discussed above, the combination of Kondylis, Cousins, and Galand does not disclose, teach, or suggest all of the elements of independent claim 1. Furthermore, Counterman does not cure the deficiencies in Kondylis, Cousins, and Galand, as Counterman also does not disclose,

teach, or suggest, at least, "*wherein the at least one guaranteed feasible flow allocation comprises at least one flow allocation for which a schedule exists that can realize the at least one flow allocation by taking into account flows in the ad hoc network*," as recited in independent claim 1. Thus, the combination of Kondylis, Cousins, Galand, and Counterman does not disclose, teach, or suggest all of the elements of claim 3. Additionally, claim 3 should be allowed for at least its dependence upon independent claim 1, and for the specific elements recited therein.

Based on the above discussion, Applicants respectfully submit that the cited prior art references fail to disclose or suggest all of the elements of the claimed invention. These distinctions are more than sufficient to render the claimed invention unanticipated and unobvious. It is therefore respectfully requested that all of claims 1-8 be allowed, and this application passed to issue.

If for any reason the Examiner determines that the application is not now in condition for allowance, it is respectfully requested that the Examiner contact, by telephone, the applicants' undersigned representative at the indicated telephone number to arrange for an interview to expedite the disposition of this application.

In the event this paper is not being timely filed, the applicants respectfully petition for an appropriate extension of time. Any fees for such an extension together with any additional fees may be charged to Counsel's Deposit Account 50-2222.

Respectfully submitted,

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Enclosures: Petition for Extension of Time
Request for Continued Examination